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(54) **SYSTEM AND METHOD FOR HEAT RECOVERY STEAM GENERATORS**

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F22D 5/00	(2006.01)
F22B 1/18	(2006.01)
F22B 35/00	(2006.01)

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CPC ***F22G 1/00*** (2013.01); ***F22B 1/1815*** (2013.01); ***F22B 35/007*** (2013.01); ***F22D 5/00*** (2013.01); *Y02E 20/16* (2013.01); *Y02E 20/18* (2013.01)

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,769,795	A *	11/1973	Rostrom	60/665
4,858,562	A *	8/1989	Arakawa et al.	122/7 R
5,628,179	A *	5/1997	Tomlinson	60/783
5,660,799	A *	8/1997	Motai et al.	422/112
5,775,266	A *	7/1998	Ziegler	122/7 R
5,924,389	A *	7/1999	Palkes et al.	122/7 R
RE36,524	E *	1/2000	Tomlinson	60/783
6,189,491	B1	2/2001	Wittchow et al.	
6,363,711	B2 *	4/2002	Schmid et al.	60/39.182
6,604,354	B2 *	8/2003	Oto et al.	60/39.182
6,829,898	B2 *	12/2004	Sugishita	60/772
7,243,618	B2 *	7/2007	Gurevich	122/7 R
7,270,086	B2 *	9/2007	Franke et al.	122/7 R
7,281,499	B2 *	10/2007	Franke et al.	122/406.5

(Continued)

OTHER PUBLICATIONS

U.S. Appl. No. 13/759,985, filed Feb. 5, 2013, Diego Fernando Rancruel.

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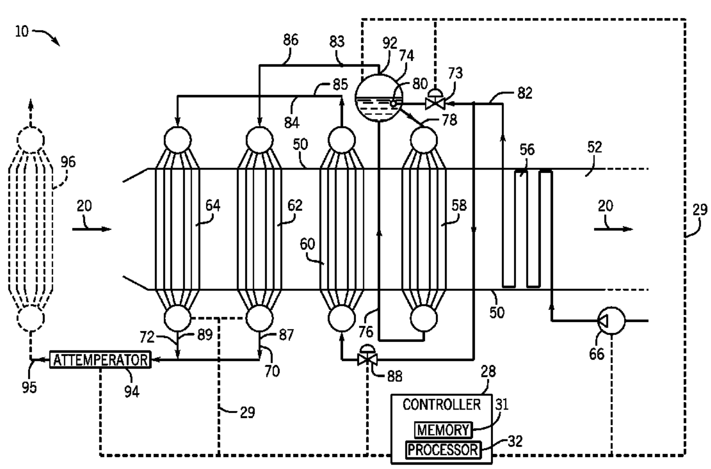
(57) **ABSTRACT**

A system includes a heat recovery steam generator (HRSG) including a plurality of evaporator sections. At least one evaporator section includes a natural circulation evaporator configured to generate a saturated steam, a once-through evaporator configured to generate a first superheated steam, a first superheater configured to receive the saturated steam from the natural circulation evaporator, and a second superheater configured to receive the first superheated steam from the once-through evaporator.

23 Claims, 2 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

7,445,652	B2	11/2008	Bax	
8,220,274	B2 *	7/2012	Bono et al.	60/772
2001/0022077	A1 *	9/2001	Hannemann et al.	60/39.182
2011/0247335	A1 *	10/2011	Schmid et al.	60/676
2012/0180739	A1 *	7/2012	Rop et al.	122/7 R
2013/0098313	A1 *	4/2013	Pang	122/460

* cited by examiner

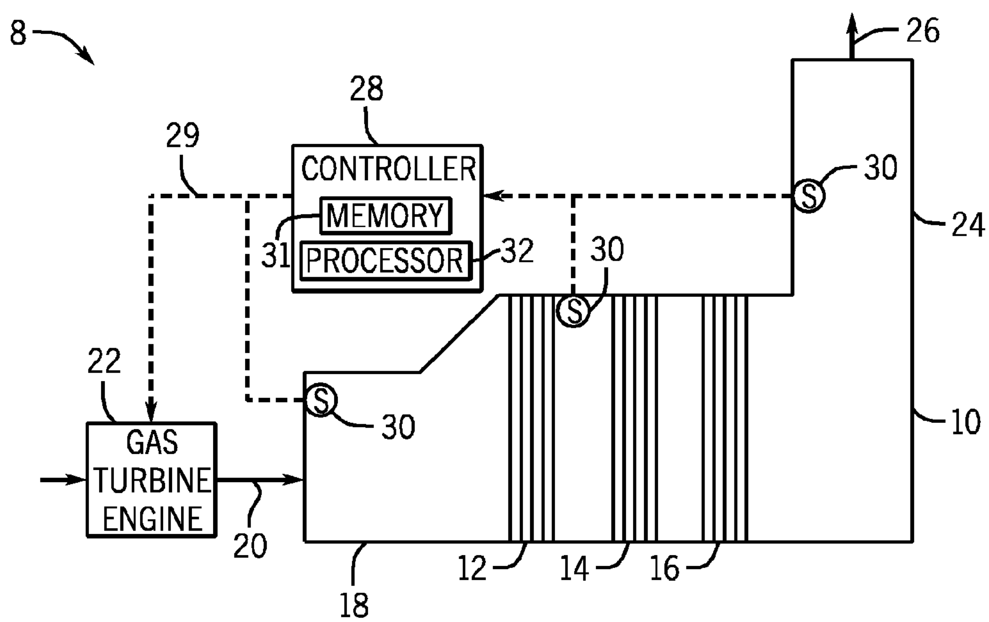

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FIG. 1

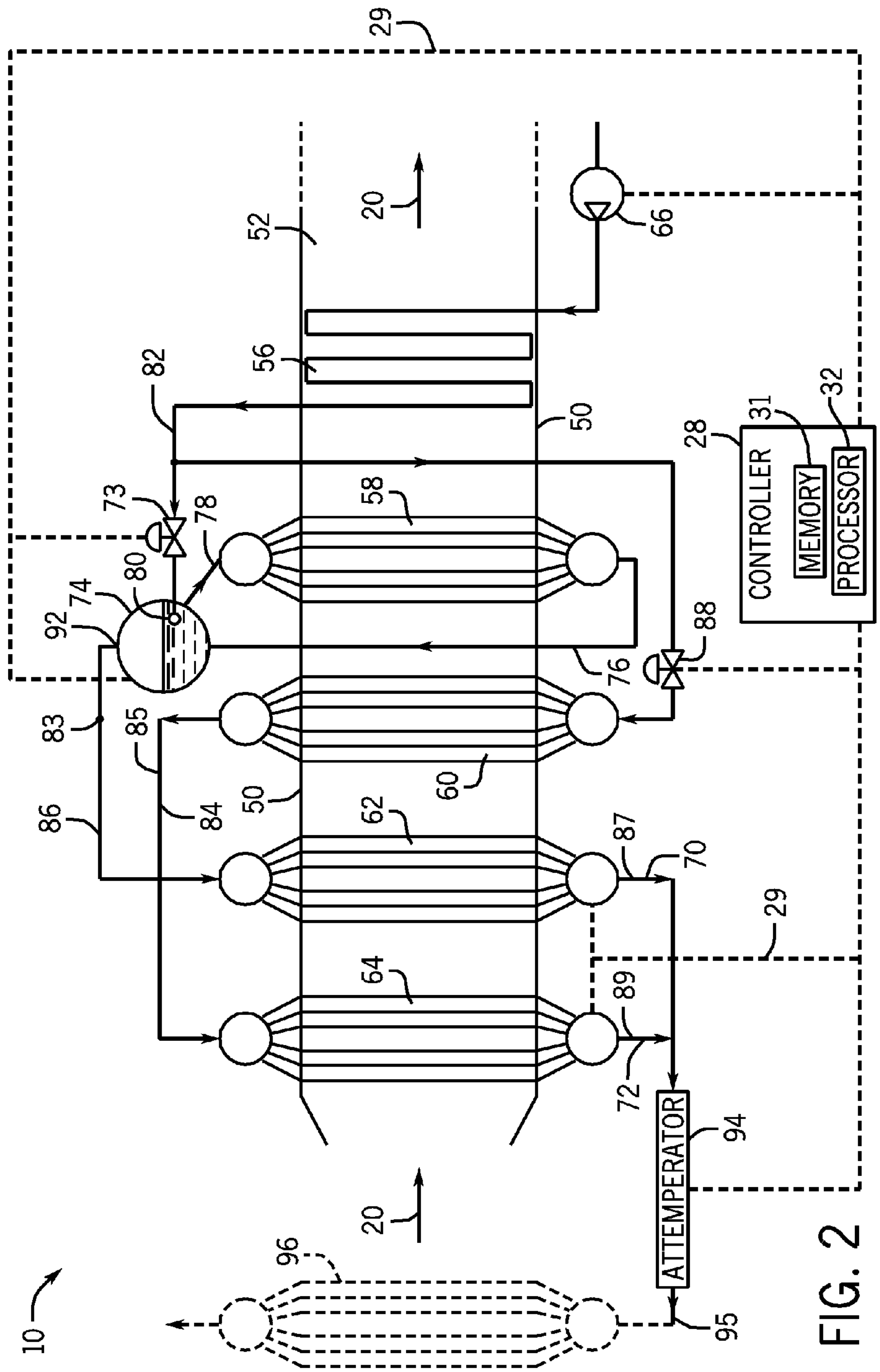
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FIG. 2

SYSTEM AND METHOD FOR HEAT RECOVERY STEAM GENERATORS

BACKGROUND OF THE INVENTION

The subject matter disclosed herein relates to operating heat exchangers, and more particularly, to systems and methods for operating heat recovery steam generators.

Heat exchangers are used to transfer heat from one medium to another in a variety of industries. A heat recovery steam generator (HRSG) is an example of a heat exchanger that may be used in combined cycle power plants and similar plants. An HRSG may use gas turbine engine exhaust to heat a fluid flowing through heat exchangers in the HRSG, for example, to convert water into steam. In some configurations, the fluid may be steam used for high-pressure, intermediate-pressure, and/or low-pressure sections of a steam turbine.

BRIEF DESCRIPTION OF THE INVENTION

Certain embodiments commensurate in scope with the originally claimed invention are summarized below. These embodiments are not intended to limit the scope of the claimed invention, but rather these embodiments are intended only to provide a brief summary of possible forms of the invention. Indeed, the invention may encompass a variety of forms that may be similar to or different from the embodiments set forth below.

In a first embodiment, a system includes a heat recovery steam generator (HRSG) including a plurality of evaporator sections. At least one evaporator section includes a natural circulation evaporator configured to generate a saturated steam, a once-through evaporator configured to generate a first superheated steam, a first superheater configured to receive the saturated steam from the natural circulation evaporator, and a second superheater configured to receive the first superheated steam from the once-through evaporator.

In a second embodiment, a method includes generating a saturated steam using a natural circulation evaporator in an evaporator section of an HRSG, generating a first superheated steam using a once-through evaporator in the evaporator section of the HRSG, generating a second superheated steam superheating the saturated steam from the natural circulation evaporator, and generating a third superheated steam by superheating the first superheated steam from the once-through evaporator.

In a third embodiment, a system includes instructions disposed on a non-transitory, machine readable medium. The instructions are configured to control a heat recovery steam generator (HRSG) to generate a first superheated steam by superheating a first steam generated from a natural circulation evaporator, generate a second superheated steam by superheating a second steam generated from a once-through evaporator, and mix the first superheated steam and the second superheated steam in an attemperator to generate a third superheated steam.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

FIG. **1** is a schematic diagram of an embodiment of an HRSG; and

FIG. **2** is a schematic diagram of a portion of an embodiment of an HRSG having a natural circulation evaporator, a once through evaporator, a first superheater, and a second superheater.

DETAILED DESCRIPTION OF THE INVENTION

One or more specific embodiments of the present invention will be described below. In an effort to provide a concise description of these embodiments, all features of an actual implementation may not be described in the specification. It should be appreciated that in the development of any such actual implementation, as in any engineering or design project, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which may vary from one implementation to another. Moreover, it should be appreciated that such a development effort might be complex and time consuming, but would nevertheless be a routine undertaking of design, fabrication, and manufacture for those of ordinary skill having the benefit of this disclosure.

When introducing elements of various embodiments of the present invention, the articles "a," "an," "the," and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements.

As discussed in detail below, the disclosed embodiments provide systems and methods for operating an HRSG. For example, a system may include an HRSG including a natural circulation evaporation section, a once-through evaporator, and independent superheaters configured to superheat the steam produced by each evaporator section. In a natural circulation evaporator, circulating water from a steam drum is partially evaporated after passing through the heated evaporator tubes. The generated steam is separated in the steam drum, and then the remaining water is recirculated to the same heated tubes for further evaporation. In a once-through evaporator, the transition from liquid to superheated steam takes place in one pass. As such, a once-through evaporator does not use the steam separating drum and water recirculation of a natural-circulation evaporator, thereby providing a potentially faster response to cycles in the gas turbine engine.

Furthermore, because independent superheaters are coupled to the natural circulation evaporator and the once-through evaporator, the two evaporator sections may run with independent operational settings, allowing increased operational flexibility and possibly higher efficiency. For example, the natural circulation evaporator may run efficiently at one pressure, while the once-through evaporator may run efficiently at a different pressure. With independent superheaters, the two evaporator sections need not run at the same pressure. The system may also include an attemperator, which attemperates the steam from the once-through section with the steam from the natural circulation evaporator, which allows the two steams to be mixed and fed to a possible final superheater and the steam turbine. Attemperation may refer to the control of a temperature of a first steam by contacting the first steam with water or a second steam at a temperature or pressure different than the first steam. Mixing steam from each type of evaporator after passing through independent superheaters allows for controls closer to the exit of the HRSG, which may result in faster response to the exit properties of the steam and possible higher efficiency.

FIG. **1** is a block diagram of an embodiment of a system **8** that includes an HRSG **10** with one or more HRSG sections (e.g. evaporator sections), each having a plurality of independent superheaters. As shown in FIG. **1**, the HRSG **10** includes a high-pressure evaporator section **12**, an intermediate-pressure evaporator section **14**, and a low-pressure evaporator section **16**. The high-pressure evaporator section **12** generates high-pressure steam, the intermediate-pressure evaporator section **14** generates intermediate-pressure steam, and the low-pressure evaporator section **16** generates low-pressure steam. Each section, **12**, **14**, and **16**, is a heat exchanger that generates steam by transferring heat from the heated exhaust gas **20** to water or steam. As discussed in detail below, each of the sections, **12**, **14**, and **16**, may include a natural circulation evaporator, a once-through evaporator, a first superheater connected to the natural circulation evaporator, and a second superheater connected to the once-through evaporator. The two independent superheaters may allow the natural circulation evaporator and the once-through evaporator to operate under different conditions (e.g., pressure) which may lead to higher efficiency of the HRSG **10**. The high-pressure section **12** is located near an inlet section **18** of the HRSG **10**. As the temperature of heated exhaust gas **20** from a gas turbine engine **22** may be highest near the high-pressure section **12**, the high-pressure section generates high-pressure steam. In other words, the high temperature of the heated exhaust gas **20** near the high-pressure section **12** provides sufficient heat to produce the high-pressure steam. The heated exhaust gas **20** from the gas turbine engine **22** enters the HRSG **10** in the inlet section **18**. After the heated exhaust gas passes through the high-pressure section **12**, the intermediate-pressure section **14**, and the low-pressure section **16**, a cooled exhaust gas **26** exits HRSG **10** from an HRSG stack **24**. Thus, the cooled exhaust gas **26** may exit from the HRSG stack **24** into the atmosphere. In other embodiments, the intermediate-pressure section **14** may be omitted or the HRSG **10** may be configured as a single-pressure system.

In certain embodiments, the system **8** may include a controller **28**, having memory **31** and a processor **32**, which may be used to control certain aspects of the system **8**. For example, the controller **28** may send or receive signals **29** from one or more sensors **30** disposed in the HRSG **10**. In certain embodiments, the sensors **30** may be disposed in the inlet section **18**, adjacent to one or more of the high-pressure section **12**, intermediate-pressure section **14**, or low-pressure section **16**, or in the HRSG stack **24**. The sensors **30** may measure various conditions or parameters of the HRSG **10**, such as, but not limited to, a level of an unburnt fuel, a level of oxygen, a level of emissions (e.g., carbon monoxide, nitrogen oxides, sulfur oxides, or any combination thereof), a temperature, a flow rate, a pressure, or any combination thereof. More specifically, the controller **28** may use the information received from the sensors **30** to generate and send signals **29** to one or more components of the system **8**. For example, the controller **28** may send or receive signals **29** from the natural circulation evaporator, the once-through evaporator, or the independent superheater. Furthermore, the controller **28** may send or receive signals **29** from the gas turbine engine **22**, or another part of the system **8**.

FIG. **2** is a schematic diagram of a portion of an embodiment of the HRSG **10**. For example, FIG. **2** may represent at least one of the evaporator sections **12**, **14**, or **16**. In certain embodiments, the HRSG **10** includes at least one evaporator that relies on natural circulation and another evaporator that is a once-through section. In certain embodiments, the outlet pressure of the evaporators may be the same, and in other embodiments the outlet pressures may be different. As shown in FIG. **2**, the HRSG **10** includes an economizer **56**, a natural circulation evaporator **58**, a once-through evaporator **60**, a first independent superheater **62**, and a second independent superheater **64**. The HRSG **10** has enclosing walls **50**, which form a heating gas duct **52** through which the heating gas from the gas turbine engine **22** flows in the direction indicated by arrows **20**. Additionally, there is a steam separating drum **74**, a feed water pump **66**, and an attemperator **94**.

Feed water passes through the feed water pump **66** to provide a controlled water supply to the economizer **56**. The feed water may come from a condenser, where steam coming from the steam turbine at low pressure and low temperature is condensed. It may be stored, preheated, and conditioned in a feed water tank before being sent to the economizer **56** by the feed water pump **66**. In certain embodiments, the feed water pump **66** may be a variable frequency pump, which may provide feed water at different flow rates by adjusting the speed of the motor coupled to the pump **66**. The economizer **56** may preheat the feed water with the enthalpy of fluid streams that are not hot enough to be used in an evaporator. The economizer **56** recovers useful heat from the system **8**, thereby increasing its efficiency. After exiting the economizer **56**, a feed water line **82** splits, allowing water to flow through a first control valve **73** or a second control valve **88**. Feed water flowing through the first control valve **73** passes through a drum water inlet **80** and into a steam separating drum **74**. The first control valve **73** maintains the water level of the steam separating drum **74** under all loads. In other words, if the level of the steam separating drum **74** falls below a threshold, the first control valve **73** may open further to allow additional feed water into the steam separating drum **74**. Similarly, if the level of the steam separating drum **74** rises above a threshold, the first control valve **73** may close further to allow less feed water into the steam separating drum **74**. More specifically, the heated water from the steam drum **74** is transported by natural circulation through downcomers **78** into the heated tubes of the natural circulation evaporator **58**, where the water heats to a saturation temperature, evaporates, and is returned to the drum **74** through risers **76** as a steam water mixture. A saturated steam **83** is separated from hot water in the drum **74**, and exits through the drum steam outlet **92**. The saturated steam **83** enters the first independent superheater **62** through the first inlet steam line **86**. The natural circulation evaporator **58** may use vertical heating tubes. As the feed water boils, bubbles will rise and cause circulation, facilitating the separation of the liquid and vapor at the top of the heating tubes. The circulating feed water may be partly evaporated when passing through the evaporator **58** tubes, so water that is not evaporated is returned to the steam separating drum **74**. Thus, feed water may be fed through the evaporator **58** tubes multiple times before fully evaporating.

Alternatively, water from the feed water pump **66** may flow from the economizer **56** to the second control valve **88**, and into the once-through evaporator **60**, located upstream of the natural circulation evaporator **58**. Because the once-through evaporator **60** is disposed upstream of the natural circulation evaporator **58** with respect to the heated exhaust gas **20** flowing through the duct **52**, the once-through evaporator **60** is exposed to higher temperature heated exhaust gas **20**, which contributes to its production of a slightly superheated steam compared to the saturated steam **83** produced by the natural circulation evaporator **58**. The natural circulation evaporator **58** is exposed to lower temperature heated exhaust gas **20** than the once-through evaporator **60**, so it has less heat transfer in the heating surfaces of the evaporator. For this reason, the natural circulation evaporator **58** may produce less steam than the once-through evaporator **60**. The interaction between the first control valve **73** and the feed water pump **66** determines the flow of water to the once-through evaporator **60** of the

HRSG **10**. For example, if the level of the steam separating drum **74** falls below a threshold, the speed of the variable frequency feed water pump **66** may be increased in order to raise the level. Alternately, if the level of the steam separating drum **74** rises above a threshold, the speed of the variable frequency feed water pump **66** may be decreased.

The natural circulation evaporator **58** produces saturated steam **83**, and the once-through evaporator **60** generates a first superheated steam **85**. The saturated steam **83** from steam separating drum **74** flows through a first inlet steam line **86** to the first independent superheater **62**, where it is superheated to produce a second superheated steam **87**. The first superheated steam **85**, produced by the once-through evaporator **60**, is carried by a second inlet steam line **84** to the second independent superheater **64**. The second independent superheater **64** produces a third superheated steam **89**. The second superheated steam **87** exits the first independent superheater **62** via a first outlet line **70**. The third superheated steam **89** exits the second independent superheater **64** via a second outlet line **72**. The first and second outlet lines **70** and **72** enter the attemperator **94**, which generates a fourth superheated steam **95**. The attemperator **94** allows for more robust control of the heated exhaust temperature of the fourth superheated steam **95** by the independent superheaters **62** and **64**. Specifically, the attemperator **94** may be configured to control the temperature of the fourth superheated steam **95** by using the steam **83** from the natural circulation evaporator **58** to attemperate the steam **85** from the once-through evaporator **60** to produce a fourth superheated steam **95**. Because the natural circulation evaporator **58** is located downstream of the heated exhaust flow **20** in the boiler duct **54** with respect to the once-through evaporator **60**, the natural circulation evaporator **58** has a lower temperature when exposed to a lower temperature heated exhaust gas **20**, and produces lower temperature steam than the once-through evaporator **60**. In contrast, the once-through evaporator **60** generates superheated steam. Because of this temperature difference, the two steams may be used to temper each other to reach a pre-determined temperature or temperature range using the attemperator **94**. Once attemperated, the fourth superheated steam **95** may be used elsewhere in the system **8**, or may be further superheated by an optional final superheater **96**, which may superheat the fourth superheated steam **95** before it is used downstream in the steam turbine, for example by a steam turbine.

Using the second superheated steam **83** and the third superheated steam **85** to attemperate each other may be more efficient than attemperating by injecting cold feed water spray into the superheated stream. By utilizing the steam **83** and **85** to attemperate each other to produce a single final steam at a desired temperature, a high thermal gradient may be minimized, thereby reducing possible damage to equipment. Furthermore, energy loss resulting from mixing the steams **83** from the natural circulation evaporator **58** and the steam **85** from the once-through evaporator **60**, which have different conditions, may be avoided by attemperation, thereby allowing a more efficient recovery of available heat.

In the once-through evaporator **60**, the feed water is evaporated and the steam is superheated in the heated evaporator **60** tubes without fluid recirculation or the use of a separating drum, such as steam separation drum **74**. Thus, in contrast to the natural circulation evaporator **58**, the once-through evaporator **60** does not utilize downcomers or a drum. Because the once-through team does not utilize a steam separating drum, which involves preheating, the once-through evaporator **60** may have a faster start-up time than the natural circulation evaporator **58**.

In certain embodiments, the HRSG **10** may include the controller **28**, having memory **31** and a processor **32**, which may be used to control certain aspects of the HRSG **10**. The controller **28** may send or receive signals **29** from one or more sensors **30**, shown in FIG. **1**, disposed in the HRSG **10**. For example, sensors **30** may be disposed at the outlet of independent superheaters **62** and **64**, at valve **88**, at feed water pump **66**, at valve **73**, and in the steam separating drum **74**. The sensors **30** may sense a level of an unburnt fuel, a level of oxygen, a level of emissions (e.g., carbon monoxide, nitrogen oxides, sulfur oxides, or any combination thereof), a temperature, a flow rate, a pressure, a water level, humidity, or any combination thereof. The controller **28** may use the information received from the sensors **30** to generate and send signals **29** to one or more components of the HRSG **10**. Specifically, the controller **28** may send signals **29** to the attemperator **94**, the feed water pump **66**, the valve **88**, or valve **73**. Additionally, the control valves **73** and **88** can be managed by the controller **28**, which distributes the water flow between the evaporator sections **58** and **60** depending on the water level in the steam drum **74** and the steam temperature in the first inlet steam line **86**, or at some other point downstream of the evaporators **58** and **60**. For example, if the sensors **30** detect a temperature above a certain threshold value in the first inlet steam line **86**, the control valve **88** may supply less feed water to the once-through evaporator **60**. Because the once-through evaporator **60** produces a hotter steam that the natural circulation evaporator **58**, reducing the flow of feed water to that evaporator may lower the temperature of the fourth superheated steam, and may be configured to control a level in the separating steam drum **74**.

Instructions for the controller **28** may be disposed on a non-transitory, machine readable medium (e.g., memory **31**), which may allow the controller **28** to control the HRSG **10**. These instructions may control the HRSG to generate a first superheated steam by superheating a first steam generated from a natural circulation evaporator, generate a second superheated steam by superheating a second steam generated from a once-through evaporator, and mix the first superheated steam and the second superheated steam in an attemperator to generate a third superheated steam. The instructions may also be configured to maintain a temperature of the third superheated steam above a threshold by adjusting at least one of a first flow rate of the first superheated steam, or a second flow rate of the second superheated steam, or a combination thereof. Furthermore, the instructions may be configured to generate a fourth superheated steam by superheating the third superheated steam, and may be configured to control a level in the steam separating drum **74**.

The system **8** or HRSG **10** may form a part of an integrated gasification combined cycle (IGCC) power plant. An IGCC power plant converts a fuel source into syngas through the use of a gasifier. An IGCC gasifier may combine a fuel source (e.g., a coal slurry) with steam and oxygen to produce the syngas. The product syngas may be provided to a combustor to combust the syngas with oxygen to drive one or more gas turbine engines. Heat from the IGCC power plant may be used to generate steam to drive one or more steam turbines. For example, the hot exhaust gases may be used to generate steam in the HRSG **10** that is then used to drive a steam turbine, which may be connected to a load to generate electricity.

As discussed above, embodiments of the HRSG **10** allow for a flexible evaporator section (e.g., **12**, **14**, or **16**) that can meet the demands of fast response combined cycle power plants. Specifically, the evaporator section may include an economizer **56**, a natural circulation evaporator **58**, a once-through evaporator **60**, a first independent superheater **62**, and a second independent superheater **64**. Additionally, there may be a steam separating drum **74**, a feed water pump **66**, and an attemperator **94**. Faster start-up times may provide more operational flexibility than HRSG's that only include natural circulation type evaporators, which require longer start-up times in order to pre-heat the steam separating drum. This technology can be applied to the high-pressure section **12**, intermediate-pressure section **14**, or low-pressure section **16**, or any combination thereof, of the system **8**. Attemperating steam from independent superheaters (e.g., **62** and **64**) allows for controls closer to the exit of the HRSG **10**, resulting in faster response to the exit properties of the steam. The HRSG **10** can also operate at two pressures, since the natural circulation evaporator **58** and the once-through evaporator **60** act independently from one another. This may increase operational flexibility and efficiency of the system **8**. Furthermore, the hybrid HRSG **10** with independent superheaters **62** and **64** may reduce the size and wall thickness of the steam separating drum **74**, as compared to an HRSG **10** that uses only natural circulation evaporators, since part of the steam is produced by a once-through evaporator **60**, which does not use a steam separating drum **74**. By using a once-through evaporator **60** and a natural circulation evaporator **58**, the overall size of the HRSG **10** may be reduced, since the size of the steam separating drum **74** may be reduced. Additionally, the use of independent superheaters **62** and **64** reduces energy loss from mixing steams of different conditions, allowing better recovery of available heat and thereby increasing operational capability.

This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal language of the claims.

The invention claimed is:

1. A system, comprising:

a heat recovery steam generator (HRSG), comprising:

a plurality of evaporator sections, wherein at least one of the plurality of evaporator sections comprises:

a natural circulation evaporator configured to generate a saturated steam;

a once-through evaporator configured to generate a first superheated steam;

a first superheater configured to receive the saturated steam from the natural circulation evaporator and generate a second superheated steam; and

a second superheater configured to receive the first superheated steam from the once-through evaporator and generate a third superheated steam, wherein HRSG comprises at least one of a plurality of features comprising:

an attemperator configured to attemperate the third superheated steam with the second superheated steam to generate a fourth superheated steam; or

each of first and second superheaters is disposed upstream of both the natural circulation evaporator and the once-through evaporator; or

a controller configured to independently control a first flow through the natural circulation evaporator and the first superheater and a second flow through the once-through evaporator and the second superheater; or

any combination thereof.

2. The system of claim **1**, wherein the HRSG comprises at least one of a high-pressure evaporator section, an intermediate-pressure evaporator section, or a low-pressure evaporator section, or a combination thereof.

3. The system of claim **1**, wherein the once-through evaporator is disposed upstream of the natural circulation evaporator.

4. The system of claim **1**, wherein the second superheater is disposed upstream of the first superheater.

5. The system of claim **1**, wherein the HRSG comprises at least two of the plurality of features.

6. The system of claim **1**, comprising the attemperator configured to attemperate the third superheated steam with the second superheated steam to generate the fourth superheated steam.

7. The system of claim **6**, comprising a third superheater configured to superheat the fourth superheated steam.

8. The system of claim **1**, comprising an integrated gasification combined cycle (IGCC) power plant having the HRSG.

9. The system of claim **1**, wherein each of the first and second superheaters is disposed upstream of both the natural circulation evaporator and the once-through evaporator.

10. The system of claim **1**, comprising the controller configured to independently control the first flow through the natural circulation evaporator and the first superheater and the second flow through the once-through evaporator and the second superheater.

11. A method, comprising:

generating a saturated steam using a natural circulation evaporator disposed in an evaporator section of a heat recovery steam generator (HRSG);

generating a first superheated steam using a once-through evaporator disposed in the evaporator section of the HRSG;

generating, via a first superheater, a second superheated steam by superheating the saturated steam from the natural circulation evaporator; and

generating, via a second superheater, a third superheated steam by superheating the first superheated steam from the once-through evaporator, wherein the method comprises at least one of a plurality of features comprising:

attemperating the third superheated steam with the second superheated steam in an attemperator to generate a fourth superheated steam; or

receiving a heated flow through first regions having the first and second superheaters upstream of second regions having the natural circulation evaporator and the once-through evaporator; or

independently controlling a first flow through the natural circulation evaporator and the first superheater and a second flow through the once-through evaporator and the second superheater; or

any combination thereof.

12. The method of claim **11**, comprising independently controlling the first flow through the natural circulation evaporator and the first superheater and the second flow through the once-through evaporator and the second superheater.

13. The method of claim **11**, wherein the once-through evaporator is disposed upstream of the natural circulation evaporator.

14. The method of claim **11**, wherein the second superheater is disposed upstream of the first superheater.

15. The method of claim **11** comprising receiving the heated flow through the first regions having the first and second superheaters upstream of the second regions having the natural circulation evaporator and the once-through evaporator.

16. The method of claim **11**, comprising attemperating the third superheated steam with the second superheated steam in the attemperator to generate the fourth superheated steam.

17. The method of claim **16**, comprising superheating the fourth superheated steam using a third superheater.

18. A system, comprising:

instructions disposed on a non-transitory, machine readable medium, wherein the instructions are configured to control a heat recovery steam generator (HRSG) to:

generate a first superheated steam by superheating a first steam generated from a natural circulation evaporator;

generate a second superheated steam by superheating a second steam generated from a once-through evaporator; and

mix the first superheated steam and the second superheated steam in an attemperator to generate a third superheated steam.

19. The system of claim **18**, wherein the instructions are configured to maintain a temperature of the third superheated steam above a threshold by adjusting at least one of a first flow rate of the first superheated steam, or a second flow rate of the second superheated steam, or a combination thereof.

20. The system of claim **18**, wherein the instructions are configured to generate a fourth superheated steam by superheating the third superheated steam.

21. The system of claim **18**, wherein the instructions are configured to control a level in a separating steam drum.

22. The system of claim **18**, comprising a controller having the instructions.

23. The system of claim **18**, comprising the HRSG having the natural circulation evaporator, the once-through evaporator, a first superheater, and a second superheater.

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